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10/629,116	07/28/2003	Peter Mardilovich	200309593-1	5931

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EXAMINER	
LEE, CYNTHIA K	

ART UNIT	PAPER NUMBER
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/629,116	MARDILOVICH ET AL.	
	Examiner	Art Unit	
	Cynthia Lee	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *49-84* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *49-84* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/26/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Reopening of Prosecution After Appeal Brief or Reply Brief

1. In view of the appeal brief filed on 8/18/2006, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

Response to an Appeal Brief

This Office Action is responsive to the Appeal Brief filed on 4/4/2007. Claims 49-84 are pending. Applicant's arguments have been fully considered and are persuasive. However, upon further consideration, the instant claims are rejected under new grounds of rejections and thus, claims 49-84 are non-finally rejected for reasons stated herein below.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 78 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation "where each pore comprises a layer in which said electrolyte is mixed with a material of said substrate, said layer being between said electrolyte said substrate" is not supported by the disclosure as originally filed. The Specification par [0028] states "a portion comprising both alumina and electrolyte impurities," but does not support a "layer in which said electrolyte is mixed with a material of said substrate, said layer being between said electrolyte said substrate."

Applicant is required to cancel the new matter in reply to this Office Action.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 58 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter

which applicant regards as the invention. It is unclear to the Examiner as to what constitutes "pre-selected desired" porosity.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 49, 51, 58, 59, 65, 66, 68, 76, 77, 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Agruss (US 3503808).

Agruss discloses a fuel cell comprising a support substrate supporting a cathode, anode, and electrolyte and a plurality of pores formed through said substrate, said pores having a size and shape formed in accordance with a pre-selected desired porosity. The anode and cathode comprise potassium and thallium and are solid anode and cathode material (claim 58).

The fuel cell is disposed in one chamber (applicant's claim 76).

The electrolyte is deposited in the pores (2:20-40). Agruss discloses that the support substrate is made of porous Alundum (2:35). Alundum is defined as

Alundum
noun Trademark

A hard material composed of fused alumina, used as an abrasive and a refractory.

Collins English Dictionary, © HarperCollins Publishers 2000

Regarding claim 51, absent specifics of the tapering, the Examiner notes that the pores will necessarily "vary in diameter by tapering to a narrow point between two openings" where one pore connects to another pore.

Regarding claim 77, since the electrolyte is in direct contact with the pores, the electrolyte is necessarily deposited on the sides of interiors of the pores.

Claims 49, 58, 68, 70-72, 74, 75, 78-81, 83, and 84 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito (US 5234722).

Ito discloses a fuel cell with a solid electrolyte film being formed on a substrate made of flat porous alumina substrate (see Abstract and 6:30-55). The anode and the cathode are disposed on both sides of the porous substrate coated with electrolyte. See fig. 5.

The Examiner notes that the pores of the alumina substrate necessarily vary in diameter through a thickness of said substrate, and the pores have a size and shape formed in accordance with a pre-selected desired porosity because the porosity has been preselected.

The cathode is made from LaMnO3 and the anode is made from nickel-zirconia cermet (6:15-22). The electrolyte is made from yttria stabilized zirconia (6:34).

Regarding claim 51, absent specifics of the tapering, the Examiner notes that the pores will necessarily "vary in diameter by tapering to a narrow point between two openings" where one pore connects to another pore.

Regarding claim 68 and 78, it is noted that in the plasma spray of the electrolyte, a composition of alumina is mixed with the electrolyte material and sprayed on a porous alumina substrate. Thus, in the heating step, the alumina will fuse with the electrolyte, and thus forms a region on a microscopic scale that possesses both the electrolyte and alumina (the porous substrate material). Further, the Specification in par. [0038] supports that any suitable method of depositing the electrolyte may be used. Thus, the electrolyte deposited by plasma spray of Ito will necessarily have the porous substrate mixed with the electrolyte.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 52-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agruss (US 3503808) as applied to claim 49, in view of Pekala (US 2002/0142214).

Agruss discloses a fuel cell comprising a support substrate supporting a cathode, anode, and electrolyte and a plurality of pores formed through said substrate.

The electrolyte is deposited in the pores (2:20-40). Agruss discloses that the support substrate is made of porous Alundum (2:35). Alundum is defined as

Alundum
noun Trademark

A hard material composed of fused alumina, used as an abrasive and a refractory.

Collins English Dictionary, © HarperCollins Publishers 2000

APA | MLA | Chicago : **Citing this entry**
Alundum. (2000). In *Collins English Dictionary*. Retrieved November 24, 2006, from http://www.xreferplus.com/entry/2616224

Agruss does not disclose the specifics of the pores (claims 51-55 and 57). However, Pekala discloses a porous substrate with through pores containing electrolyte. The porous substrate supports gel electrolyte on both sides and liquid electrolyte is filled in the pores. [0047].

Pekala discloses a porous substrate with pores that vary in diameter along a thickness of the substrate (applicant's claim 51). The pores also branch within the substrate (applicant's claim 52). The branching results in a greater number of pore openings on one side than on another side (applicant's claim 53). The Office notes that since branching occurs randomly on both sides of the substrate, various portions of the substrate will meet claim 54 in which the anode is disposed on the side with greater pores. Further, since pores that contain

multiple branching will be necessarily be larger than pores without branching or pores with a single branch, the average pore size containing multiple branching are larger than the average pore size of a single branching or no branching (applicant's claim 57). See Fig 5a. The pores in the substrate varies in diameter through a thickness of said substrate (claim 49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Agruss' electrolyte substrate with Pekala's porous substrate for the benefit of more evenly distributing the Agruss' electrolyte in the fuel cell.

Regarding claim 55 and 57, Fig 2 and 3 depicts images of the porous substrate. Absent a definition of what the Applicant means by "substantially," the pores shown in Fig 2 and 3 meet the limitation "substantially uniform in size and shape."

It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both Agruss and Pekala address the technology of distributing the electrolyte solution through a porous material.

Claims 60-64, 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agruss (US 3503808) as applied to claim 58 in view of Pekala (US 2002/0142214).

Agruss discloses all the elements of claim 58 and are incorporated herein. Agruss does not disclose the specifics of the pores. However, Pekala discloses a porous substrate with through pores containing electrolyte. The porous substrate supports gel electrolyte on both sides and liquid electrolyte is filled in the pores. [0047].

Pekala discloses a porous substrate with pores that vary in diameter along a thickness of the substrate (applicant's claim 60). The pores also branch within the substrate (applicant's claim 61). The branching results in a greater number of pore openings on one side than on another side (applicant's claim 62). The Office notes that since branching occurs randomly on both sides of the substrate, various portions of the substrate will meet claim 63 in which the anode is disposed on the side with greater pores. Further, since pores that contain multiple branching will be necessarily be larger than pores without branching or pores with a single branch, the average pore size containing multiple branching are larger than the average pore size of a single branching or no branching (applicant's claim 67). The pores are parallel through the substrate (applicant's claim 64). See Fig 5a.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Agruss' electrolyte substrate with Pekala's porous substrate for the benefit of more evenly distributing the Agruss' electrolyte in the fuel cell.

It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular

problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both Agruss and Pekala address the technology of distributing the electrolyte solution through a porous material.

Claims 52-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 49, in view of Pekala (US 2002/0142214).

Ito discloses a fuel cell with a solid electrolyte film being formed on a substrate made of flat porous alumina substrate (see Abstract and 6:30-55). The anode and the cathode are disposed on both sides of the porous substrate coated with electrolyte. See fig. 5.

Regarding claim 69, Agruss' porous substrate will mix with the electrolyte because the electrolyte is in solution form. Particularly, the molten metal fuel cell operates at high temperatures (3;1-5), and thus, diffusion of the electrolyte solution into the fused alumina particles will be enhanced.

Ito does not disclose the specifics of the pores (claims 51-55 and 57). However, Pekala discloses a porous substrate with through pores containing electrolyte. The porous substrate supports gel electrolyte on both sides and liquid electrolyte is filled in the pores. [0047].

Pekala discloses a porous substrate with pores that vary in diameter along a thickness of the substrate (applicant's claim 51). The pores also branch within

the substrate (applicant's claim 52). The branching results in a greater number of pore openings on one side than on another side (applicant's claim 53). The Office notes that since branching occurs randomly on both sides of the substrate, various portions of the substrate will meet claim 54 in which the anode is disposed on the side with greater pores. Further, since pores that contain multiple branching will be necessarily be larger than pores without branching or pores with a single branch, the average pore size containing multiple branching are larger than the average pore size of a single branching or no branching (applicant's claim 57). See Fig 5a. The pores in the substrate varies in diameter through a thickness of said substrate (claim 49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's electrolyte substrate with Pekala's porous substrate for the benefit of more evenly distributing the Ito's electrolyte in the fuel cell.

Regarding claim 55 and 57, Fig 2 and 3 depicts images of the porous substrate. Absent a definition of what the Applicant means by "substantially," the pores shown in Fig 2 and 3 meet the limitation "substantially uniform in size and shape."

It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24

USPQ2d 1443 (Fed. Cir. 1992). In this case, both Ito and Pekala address the technology of distributing the electrolyte solution through a porous material.

Claims 60-64, 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 58 in view of Pekala (US 2002/0142214).

Ito discloses all the elements of claim 58 and are incorporated herein. Ito does not disclose the specifics of the pores. However, Pekala discloses a porous substrate with through pores containing electrolyte. The porous substrate supports gel electrolyte on both sides and liquid electrolyte is filled in the pores. [0047].

Pekala discloses a porous substrate with pores that vary in diameter along a thickness of the substrate (applicant's claim 60). The pores also branch within the substrate (applicant's claim 61). The branching results in a greater number of pore openings on one side than on another side (applicant's claim 62). The Office notes that since branching occurs randomly on both sides of the substrate, various portions of the substrate will meet claim 63 in which the anode is disposed on the side with greater pores. Further, since pores that contain multiple branching will be necessarily be larger than pores without branching or pores with a single branch, the average pore size containing multiple branching are larger than the average pore size of a single branching or no branching (applicant's claim 67). The pores are parallel through the substrate (applicant's claim 64). See Fig 5a.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's electrolyte substrate with Pekala's porous substrate for the benefit of more evenly distributing the Ito's electrolyte in the fuel cell.

It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both Ito and Pekala address the technology of distributing the electrolyte solution through a porous material.

Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 58, in view of Hibino (A low-operating-temperature solid oxide fuel cell in hydrocarbon-air mixtures, Science, vol 288, pgs 2031-2033).

Ito does not disclose that the fuel cell is a single chamber fuel cell. However, Hibino discloses a solid oxide fuel cell that is a single chamber fuel cell. It provides for a more compact design because the reactant gases do not have to be separated. The compact design also would reduce any issues with sealing the anode and cathode reactant gases from each other. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the fuel cell of Ito a single chamber fuel cell for the benefit of designing a more compact fuel cell.

Claim 73 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 72, in view of Doshi (US 6558831).

Ito discloses that the fuel electrode is made of nickel-zirconia cermet, but does not disclose that the fuel electrode is made from nickel and yttria-stabilized zirconia cermet. However, Doshi teaches that the anode is a nickel/YSZ. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's anode material for Doshi's nickel/YSZ because nickel-zirconia cermet and nickel/YSZ are art recognized equivalents as an anode material. See MPEP 2144.06.

Claim 82 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 5234722) as applied to claim 81, in view of Doshi (US 6558831).

Ito discloses that the fuel electrode is made of nickel-zirconia cermet, but does not disclose that the fuel electrode is made from nickel and yttria-stabilized zirconia cermet. However, Doshi teaches that the anode is a nickel/YSZ. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Ito's anode material for Doshi's nickel/YSZ because nickel-zirconia cermet and nickel/YSZ are art recognized equivalents as an anode material. See MPEP 2144.06.

Response to Arguments

Applicant's prior art arguments filed 4/4/2007 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's prior art arguments with respect to Sarkar have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that the electrode materials of Agruss are liquid and not solid cathode and solid anode material. Claim 58 recites a solid cathode material and a solid anode material. It is noted that potassium and thallium are solid materials because at temperature 173 C or below, thallium is solid (3:5-15). Thus, when the fuel cell is starting up from room temperature to its operating temperature, the fuel cell of Agruss would read on the instant claim limitations of "a solid cathode material" and "a solid anode material".

Applicant argues that Pekala teaches a "polymer web" and therefore the polymer web taught by Pekala has no impact on or relevance to the pores in the *alumina* substrate taught by Agruss (emphasis in original). The Examiner remains unpersuaded because as stated in the previous Office action, both Agruss and Pekala address the technology of distributing the electrolyte solution through a porous material. In terms of the enablement of the make of the variable diameter pores in a ceramic substrate, the Examiner notes that one of ordinary skill in the art would have been able to make a ceramic substrate with varying diameters. Refer to Hybrid Micromachining and Surface Microstructuring of Alumina Ceramic, Peter Mardilovich, Dmitri Routkevich, Alexander Govyadinov, Electrochemical Society Proceedings, vol. 2000-19, 33-39, as submitted by the Applicants.

Applicant argues that Pekala does not teach "said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point." The Examiner notes that the pores of Pekala necessarily "vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point" because the pore size is not uniform throughout its length. Absent specifics of the narrowness with respect to the two openings, Pekala's pores have been found to read on the Applicant's instant claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ckl

Cynthia Lee

Patent Examiner

Supervisory Patent Exr